History of

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Chapter II

MISSILE WARNING

This paragraph is not within the scope of your request.

Sensors

The Defense Support Program

When future historians chronicle the means by which the United States deterred nuclear attack and averted many of the tensions that have traditionally contributed to the outbreak of conflict, they may well give major credit not to the siloed ICBMs, alert-poised bombers, or deep-ranging Trident submarines, but instead to the satellites of the Defense Support Program, whose unwavering vigilance assured that war would never come as the result of miscalculation or deliberate aggression prompted by the advantage of mounting a surprise attack.

Since the early 1970s the Defense Support Program (DSP) has maintained an array of satellite missile warning sensors in geosynchronous earth orbits for the purpose of mounting infrared surveillance with Schmidt telescopes against Soviet missile complexes in Eurasia and their ballistic missile submarine patrol areas in the Atlantic and Pacific oceans. Each satellite also carried sensors for detecting nuclear explosions on earth or in space. (

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; Resembling oversized old-fashioned ink bottles, they were poised in space at an altitude of 26,000 miles and spun about their axes at

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Each satellite was judged capable of detecting (under optimum conditions)

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The vanguard of a new generation of DSP sensors joined the constellation on 21 December 1984, as Flight 12 was lofted into orbit to replace Flight 11 b(1) The first of the Sensor Evolutionary Development vehicles, Flight 12 was the advance guard of the follow-on DSP-1 satellite generation, whose members were expected to be in service by September 1987.

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Old or new, all of the active DSP satellites depended upon a global network of ground control/receiver stations to direct and monitor their operations. b(1)

the Overseas Ground Station (OGS) at Nurrangar, Australia, which was sited approximately 300 miles northwest of Adelaide. DSP-East data reception and control was also possible when required from the

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Control and communications redundancy was provided by the b(1)

Data cross-link transmission from satellite to satellite to ground station was among several communications upgrades being programmed for DSP by the command in 1985.

1985 opened for DSP with b(1)

Age was quickly catching up with the other satellites held in reserve parking orbits. Flight 7 had been suffering from excessive b(1) at the end of 1984, and on 24 January it lost its b(1) ;

Recovery proved impossible, and it remained in its previous orbit with no danger of collisions with other assets.3

Flight 6, which had previously served as DSP-East reserve, in

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and recovery proved impossible in its case as well. On 13 February it was released from operational/limited reserve status to Space Division for end-of-life testing. On 6 March the satellite entered super-synchronous orbit.[4]

Flight 8 had long suffered from

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again on 29 May when Flight 12 assumed station as the operational west Pacific sensor.[5]

Flight 9 continued in service as the operational east satellite until 4 April, although it continued in the Fly-By-Wire (FBW) control status that it had experienced since the preceding September in order to maintain fine earth pointing capability. On

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On 4 April Flight 11 replaced it as the primary east satellite. On 10 April Flight 9 b(1) and on 24 April it was placed in storage to conserve fuel. As the east backup satellite it could be recalled to operations b(1)

Flight 10 remained the primary b(1)

Although it suffered b(1).

on station and functioned satisfactorily throughout the year. Flight 11, which had been launched in April 1984,

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Following its December launch, Flight 12 entered an extended period of operational verification until it began service as the

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Planning, deployment and operations for DSP were never static. They evolved as sensors aged, requirements were redefined, and improved sensors were readied for deployment. By mid-November the b(1) were performing well, b(1) The command was concerned that the failure of one or both of them could result in degradation of the system's ability to acquire and transmit attack warning information. This concern prompted CINCAD to request the launch of Flight 13 at the earliest possible date. This was a prudent measure, given the existing likelihood that at least one of the surviving sensors might require replacement.[9]

A DSP satellite's usable life was based upon the length of its full capability span of operations against the threat. b(1)

The current constellation was rapidly approaching (if not already exceeding) the anticipated life-spans of most of its sensors. By May 1985 Flight 8 b(1)

It was obviously only a matter of time before a replacement satellite would have to be launched.[10]

As early as June, Space Division had been working toward a 25 September launch date for Flight 13. It would provide the command with its stated requirement of b(1)

Great hopes were held for Flight 13. General Herres foresaw that such an event would "provide us with the flexibility to operate the spare b(1)

When Flight 13 arrived on station in good order, the DSP constellation would be arrayed as follows: b(1)

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Despite its eminent attractiveness, this deployment plan was hostage to the successful launch of Flight 13, and that was by no means a foregone conclusion as 1985 passed toward the last leaves of the calendar.

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Contingency planning for the failure of a Flight 13 launch had already been conducted.

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Fortunately, the continued successful functioning of the existing constellation of sensors and the continued delay in launching Flight 13 made these issues of less immediate concern as 1985 ended. Although the problems with the launch vehicle would persist until well into the new year, thus denying the system valuable reinforcement, DSP had continued to hold the line in all sectors against the threat of missile attack. Few systems of such expense and complexity had rendered such a consistently superior service.[16]

The successful functioning of DSP hinged upon political as well as technological factors.

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As planning for the scheduled 7 May briefing and discussion went forward, Assistant Secretary of the Air Force Tidal McCoy issued a set of guidelines for public exposure of the issues involved. Secretary McCoy was concerned that "We are responding to political, public, and media requests for AF comments/views on those activities

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Secretary McCoy implemented a well-defined strategy for dealing with the problem. First, an official statement was issued for use by Air Force authorities who were solicited

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The DSP program registered a significant milestone on 12 November when DCS/Plans published an updated System Operational Concept (SOC). This document covered "the operation of the Defense Support Program in all phases of conflicts and states Space Command requirements needed to maintain the DSP program." In the words of Brigadier General G. Wesley Clark, DCS/Plans, the publication addressed "the changes in the satellite configuration starting with a new series of satellites, called DSP-1 satellites, and the associated changes in the fixed and mobile ground stations to make them compatible with the new satellites." Additionally, the SOC described "a new architecture for the DSP system which was driven by the new Attack Warning/Attack Assessment Architecture." As such, the document provided an invaluable overview of this next link in the evolving sensor system.[21]

Flight 14 was to be the first DSP-1 unit readied for operational service. Each of these new satellites was to consist of a Sensor Segment and a Spacecraft Segment.

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Their design life matched that of the IR sensors.

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The DSP-1 Spacecraft Segment consisted of three major subsystems: (1) electrical power and distribution; (2) propulsion; and (3) attitude control. The electrical power and distribution system received electrical power from four solar paddles deployed behind the spacecraft and four pairs of cylindrical solar panels surrounding the main spacecraft body.

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The Attitude Control Subsystem consisted of (1) two earth sensors; (2) two sun sensors; (3) reaction wheel redundant electronics; (4) a rate gyro; and (5) two control electronics assemblies. This subsystem achieved initial earth acquisition and maintained earth pointing over the life of the sensor. It also supported the Laser Cross-link (LCS) by minimizing satellite motion during LCS acquisition of another satellite in the constellation.[28]

The new generation of DSP-1 satellites would remain dependent upon existing ground processing and control stations, which were slated for upgrade and enlargement. The DSP Ground Processing Subsystem supporting the new satellites was planned to consist of two Large Processing Stations (LPS), one Multi-Purpose Facility (MPF), one Simplified Processing Station (SPS), the Mobile Ground System (MGS), and the Depot Maintenance Facilities (DMF). After reaching FOC, the existing Operational Support Module (OSM), sited at the IBM facility at Westlake, California, was to be deactivated or merged with the MGS Software Maintenance Facility at the same location.

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and the OGS at Nurrangar, South Australia. A Data

Distribution Hub (DDH) was planned b(1) The DDH would provide non-survivable low-speed mission data and Teletype User Data Entry (TUDE) information distribution between the CGS, OGS, SPS, and all fixed low speed users via commercial landlines and satellite links. In addition, non-survivable High-Speed data would be provided to all users until the primary users had converted to survivable communications links such as Milstar, JRSC/DSCS, NETS, GWEN, Fiber Optics, AFSATCOM UHF/LOS and Commercial Communications Media.[29]

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The ground control and processing stations were supplemented by the Mobile Ground System (MGS), which consisted of a Mobile Ground Subsystem (MGS), and a Ground Support Subsystem (GSS). The MGS was intended to provide a very survivable ground processing element for the DSP system. Mobility, proliferation, and autonomous operations were seen as the keys to its survivability. Each Mobile Ground Subsystem consisted of a Mobile Ground Terminal (MGT) and a Mobile Communications Terminal (MCT), each housed in a semitrailer.

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The Ground Support Subsystem (GSS) was intended to provide operational and logistic support for all phases of MGS operations. The GSS included: the Main Operating Base (MOB), Support Vehicles (the survivable portion of the MGS), a Software Development and Maintenance Facility (SDMF), and an Intermediate Maintenance Facility (IMF).

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The MOB provided a permanent duty station for MGS personnel, a centralized supply/storage/control and management point, organizational maintenance on all MGS equipment, headquarters functions for all personnel, and supervisory and administrative support to include all functions of command, hardware maintenance, limited software analysis, operations, training, and security. The MOB and related base support

maintained the MGS tractors, trailers, Power Generation Units (PCU), and Environmental Control Units (ECU).

The MGS employed additional vehicles in support of the MGTs and MCTs. These included two crew vehicles per each MGS, the Crew Quarters Trailer (CQT) and the Crew Support Vehicle (CSV). They were equipped to provide sleeping, dining, and relaxation facilities for crew members. Two security vehicles were also required for each MGS. Standard, four-wheel drive vehicles, they were used by deployed security personnel to provide perimeter patrol, interdiction, and access control in the vicinity of the deployed MGS. Additional security vehicles were planned for future acquisition. They would also provide counter-surveillance support to prevent anyone from tailing the MGS as it departed the MOB enroute to a deployment site. Designated Field Spares Vehicles (FSV) were equipped to serve as mobile depots for spare parts, assemblies, and other mission-critical equipment.

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The Software Development and Maintenance Facility (SDMF) was planned to include a full complement of MGT computer processors and peripherals to support software maintenance and development efforts. Capable of receiving and processing live and simulated, real-time or wide-band satellite data, the facility was to develop and test new or modified software. Its real-time data reception capability was expected to allow extended software testing of new software versions without impacting Intermediate Maintenance Facility (IMF) or operational hardware resources. The SDMF is currently located at the IBM facility in Westlake, California, where it is used for software analyst training.

The IMF consisted of a full complement of MGT data processing communications equipment, wide band tape drives, a spacecraft simulator, peripherals and test equipment for intermediate hardware maintenance. Located at the MOB, the IMF was used for chassis troubleshooting/fault isolation down to the circuit card; selected repairs of chassis and circuit cards; and verification of repairs prior to return to operational spares. The IMF was also used for training of operations and hardware maintenance personnel, software testing/preliminary analysis activities at the MOB, and configuration management/control of operational software tape libraries.

Depot Maintenance Facilities (DMF), with the exception of those needed for crypto equipment, were to be identified and provided, as required, by the DSP system manager, Sacramento Air Logistics Center, McClellan AFB, California, who was designated the end item manager for the MGS system. The Air Force Cryptologic Support Center was tasked to handle crypto equipment.

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Limited Operational Capability for the new system was forecasted for approximately February 1988, following

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During 1985 the MGT element of the new system experienced the most tangible degree of progress, albeit tinged with the growing pains of a new concept and new hardware designed to implement it under trying circumstances.

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This result did not stem from any lack of effort or aptitude on the part of the unit's personnel, but rather from customary difficulties encountered in testing and deployment for operations virtually any technologically sophisticated system.[40]

Throughout the early months of the year the squadron worked diligently to train on the available vehicles and equipment in preparation for reaching IOT&E status with the system which was originally slated for 9 September 1985. Although the need for an additional six truck tractors and six crew support trailers kept the unit from reaching its TO&E vehicle allotment, and the necessity for software modifications hindered the system's development, the squadron's personnel maintained a determined training schedule as they entered the summer.

The system's IOT&E date was eventually slipped from 9 to 30 September due to a shortage of spare parts for the communications vehicles and software immaturity. Budget reductions in April had also affected funding for communications equipment, but the emphasis remained on bringing the program into IOT&E on schedule. The extant MGS did enter IOT&E status on 30 September and remained there at year's end. During that period the system also participated in a "Proof of Concept" overseas deployment that was designed to support contingency planning for such operational moves in the future.[41]

DSP system planners realized that the Laser Crosslink System (LCS) to provide eastern satellite data to CONUS ground stations would probably not reach IOC until 1989. The MGS with its survivable DSP ground processing capability was slated to reach IOC sometime in 1986. During this three-year gap in the respective systems' capability dates, the MGS could be utilized to back up the OGS or SPS if required following airlift deployment from CONUS. By mid-March DCS/Plans was calling for a planning schedule to support an MGS deployment exercise to a suitable overseas base.

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